PLANNING FOR TRAIL FACILITIES

Design Standards for Shared Use Paths

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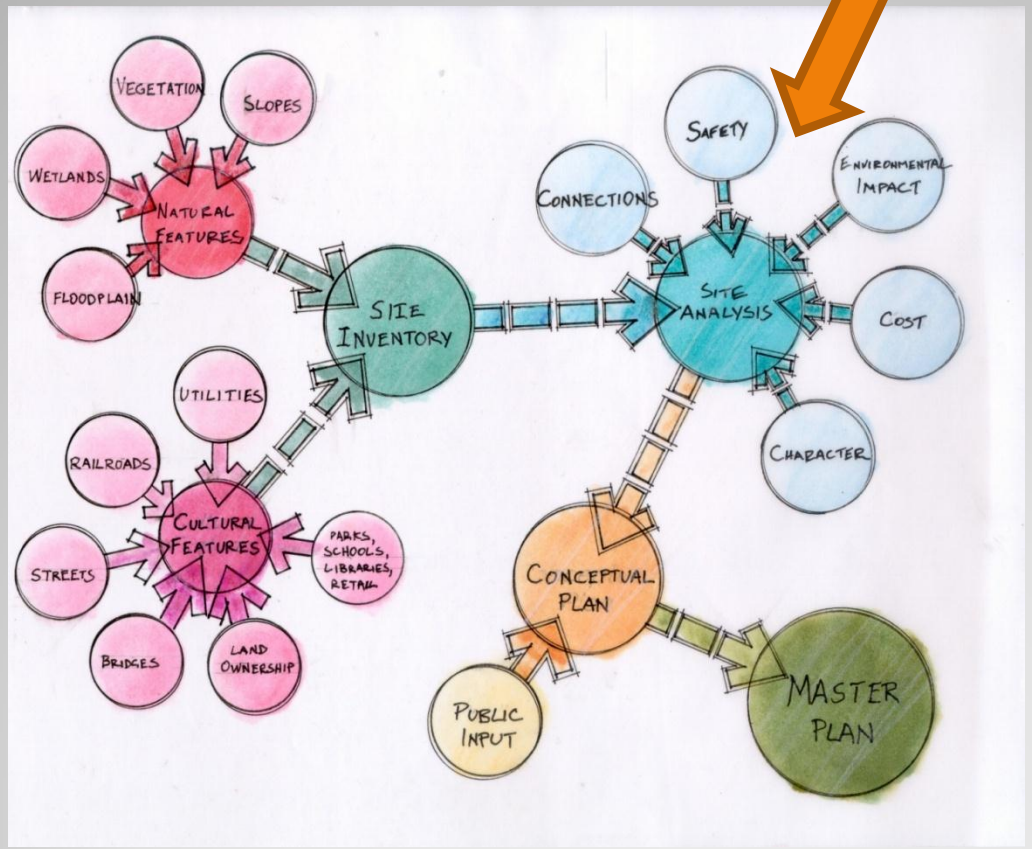
SHARED USE PATH STANDARDS

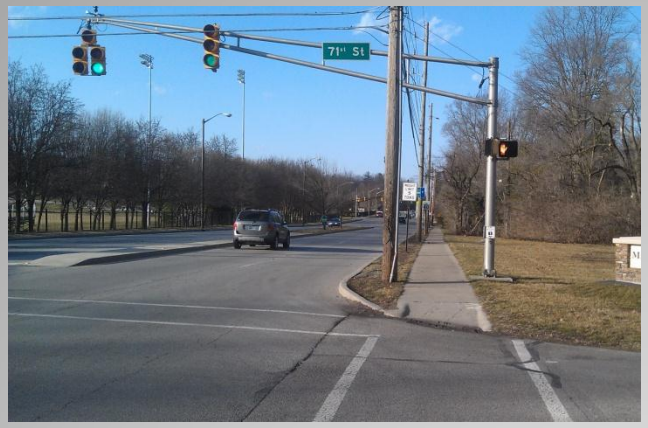


PLANNING PROCESS

GOVERNING REGULATIONS

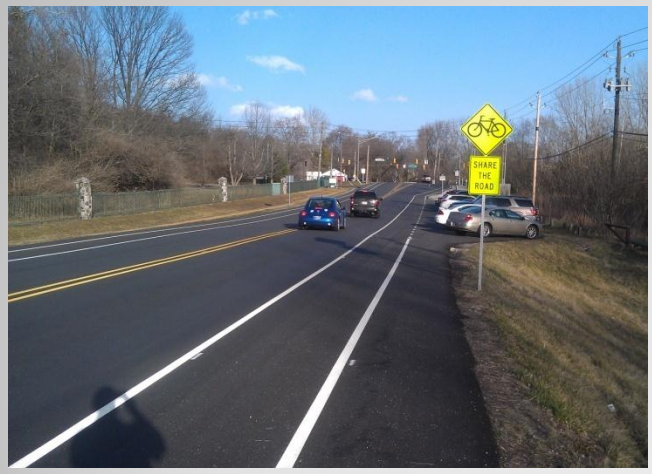
GOVERNING REGULATIONS

- Federally Funded
  - INDOT Design Manual – Chapter 51, Section 7.0
  - Indiana Manual for Uniform Traffic Control Devices (MUTCD) 2011
  - Americans With Disabilities Act and Architectural Barriers Act, Accessibility Guidelines – 2010 Standards (Signed March 2012 by DOJ)
  - Outdoor Accessibility Guidelines
- Locally Funded
  - AASHTO - Guide for the Development of Bicycle Facilities, 1999
  - Indiana Manual for Uniform Traffic Control Devices (MUTCD) 2011
  - Americans With Disabilities Act and Architectural Barriers Act, Accessibility Guidelines – 2010 Standards
  - Outdoor Accessibility Guidelines
  - NACTO – Urban Design Guide
- Future Standards
  - AASHTO - Guide for the Development of Bicycle Facilities Update
  - US Access Board - Shared Use Path Guidelines
  - US Access Board – Accessibility in Public Rights-of-Way



SIDEWALK

TRAIL

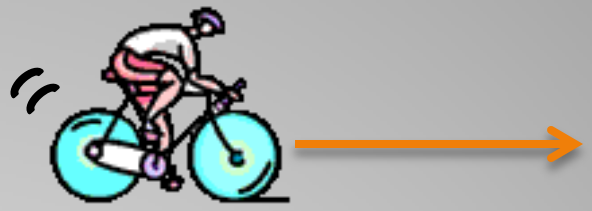


BIKE LANE

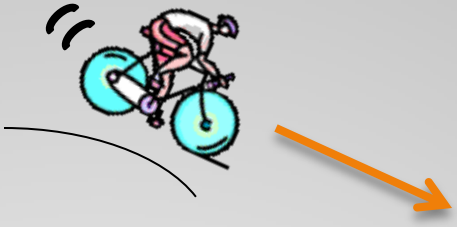
SHARED USE PATH

DEFINITIONS

- DESIGN SPEED
  - Average Speed of a Bicycle = 11 mph
  - Average Speed of Recumbent Bicycle = 14 mph

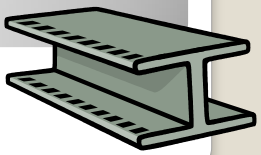


  - Minimum Design Speed = 15 mph
    (Urban Areas and Flat Areas)
  - Desired Design Speed = 20 mph
    (Hilly Areas and Rural Areas)



A. DESIRED MINIMUM RADIUS OF HORIZONTAL CURVE
   1. 15 MPH = 60 FEET (SIGN CURVE)
   2. 20 MPH = 100 FEET

NON-FLEXIBLE DESIGN STANDARDS

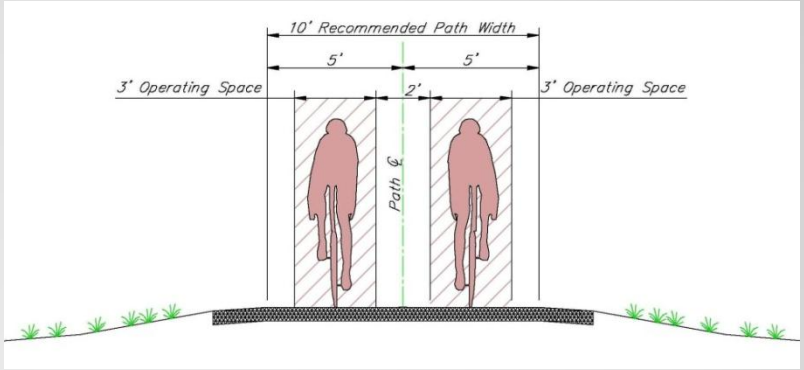


- PATH WIDTH
  - Average Width of a Bicycle = 2.0 Feet
  - Average Bicycle Operating Space = 3 Feet
  - 97.5 Percentile (large) Man Shoulder Width = 1’ 8”

A. Recommended = 10 Feet

B. Desired = 12 Feet or 14 Feet
(Urban areas, wide maintenance vehicles)

A. Minimum = 8 feet



NON-FLEXIBLE DESIGN STANDARDS

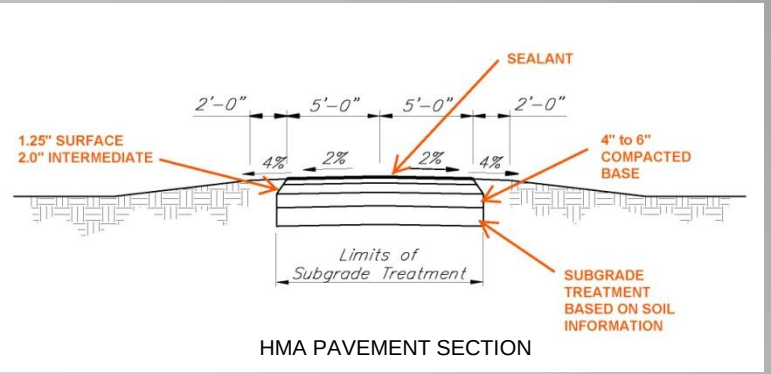
- VERTICAL CLEARANCE
  - Design Vertical Height = 8 Feet Minimum
  - Other Considerations
    A. Maintenance Vehicles and Emergency Vehicles – 10 Feet Required
    B. Tree Clearing – Recommend 12 Feet

NON-FLEXIBLE DESIGN STANDARDS

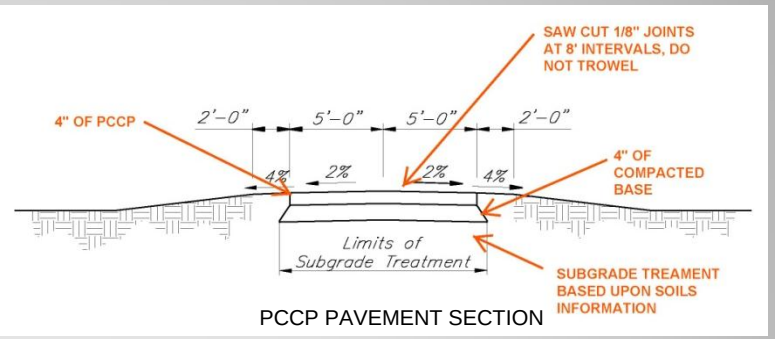
- TRAILHEAD ACCESSIBILITY
  - Required to Have Access Routes Complying with American with Disabilities Act Between Parking, Path, and Trailhead Amenities
    A. Longitudinal Slope = Less than 5 %
    B. Cross Slope = Less than 2%
  - Parking
    A. At Least 1 Van Accessible Space For Every 6 Car Accessible Spaces
    B. 1 Car Accessible Space Per 25 Spaces (Up to 100, See ADAAG for Over 100)
    C. Access Aisle = 5 Feet Wide
    D. Van Access Space = 11 Feet Wide
    E. Car Access Space = 8 Feet Wide

NON-FLEXIBLE DESIGN STANDARDS

- PAVEMENT DESIGN / SECTION
  - INDOT Standard Pavement Section for HMA and PCCP



HMA PAVEMENT SECTION



PCCP PAVEMENT SECTION

  - Pavement Section Can Be Modified, But Will Require Pavement Design, a Geotechnical Report, and Approval

DESIGN GUIDELINES

- RECOVERY AREA
  - Minimum Graded Shoulder = 2 Feet Wide Graded @ 6:1
  - Desirable Clearance Between Lateral Obstructions = 3 Feet

    (Trees, Poles, Wall, Fences)
  - Desirable Clearance Between Edge of Path and a Grade Break Greater than 3:1 = 5 Feet
    A) Consider A Physical Barrier For the Following Conditions:
       1. Slope Greater Than 3:1 and Drop-off Greater Than 6 Feet
       2. Slope Greater Than 2:1 and Drop-off Greater Than 4 Feet
       3. Slope Greater Than 1:1 and Drop-off Greater Than 2 Feet

DESIGN GUIDELINES

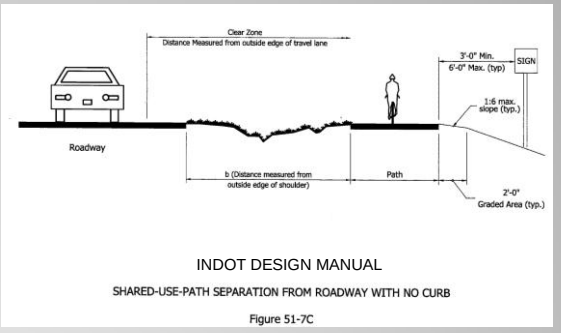
- SAFETY RAIL / BICYCLE GUARDRAIL HEIGHT
  - Minimum Height = 42 Inches
  - Center of Gravity for a 95th Percentile Adult Male on a Bicycle = 45.9 Inches
    A. Consider Increasing Height Rail on Steep Declines With a Sharp Turn at the Bottom to 48 or 54 Inches

DESIGN GUIDELINES

- SEPARATION BETWEEN PATH AND ROAD

  - Minimum Separation Using AASHTO = 5 Feet
    (Edge of Path to Edge of Road Pavement)

  - Minimum Separation Using INDOT Chapter 51

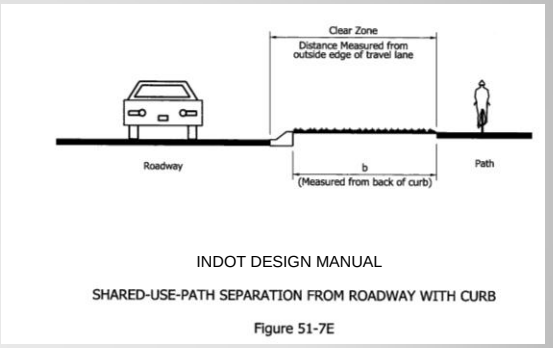


INDOT DESIGN MANUAL

SHARED-USE-PATH SEPARATION FROM ROADWAY WITH NO CURB

Figure 51-7C

A. Non-Curb Section
    1. Speed Limit Less Than or Equal 45 MPH =20 Feet Desirable
    2. Speed Limit Less Than or Equal 45 MPH =10 Feet Minimum
    3. Speed Limit Greater Than or Equal 50 MPH = 24 to 35 Feet
    4. If Roadway Clear Zone is Greater, Must Use This Distance



INDOT DESIGN MANUAL

SHARED-USE-PATH SEPARATION FROM ROADWAY WITH CURB

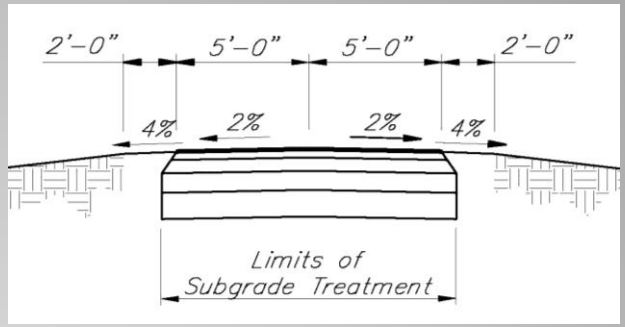
Figure 51-7E

B. Curb Section (From Back of Curb to Edge of Path)
    1. Speed Limit Less Than or Equal 30 MPH = 3 Feet with Parking
    2. Speed Limit Less Than or Equal 30 MPH = 5 Feet Minimum
    3. Speed Limit 35 or 40 MPH = 5 Feet Minimum
    4. Speed Limit Greater Than 45 MPH = 10 Feet Minimum
    5. If Roadway Clear Zone is Greater, Must Use This Distance

DESIGN GUIDELINES

- SHARED USE PATH GRADING

  - Cross Slope = 2%
  - Shoulder Cross Slope = 4%



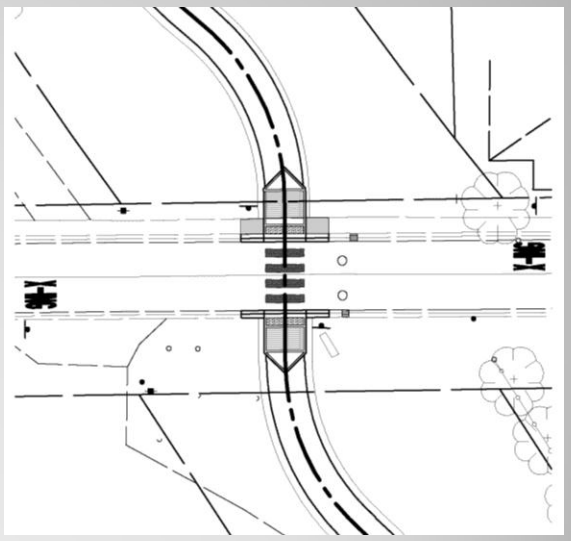
  - Profile Grade
    A. Less Than 5% is Desirable
    B. May Exceed 5% Where Terrain Requires For Short Distances (Recreation Trails)
       1. Between 5% and 7% for 800 Feet Max.
       2. Between 7% and 8% for 400 Feet Max.
       3. Between 8% and 9% for 300 Feet Max.
       4. Greater Than or Equal to 9% for 200 Feet Max.
    C. Consider Goal or Use of Trail
       1. Recreational?
       2. Safe Connection to Community?
          a) Maximum ADA Slope = 8.33%

DESIGN GUIDELINES

- PROFILE GRADE SLOPE MITIGATION
  - Consider the Following:

A. On Longer Grades Widen Pavement Width by 4-6 Feet to allow slower speed bicyclists to dismount and walk;
B. Eliminate hazards to the path user near the end of a steep downgrade or ramp;
C. Warn the path user by means of signage ahead of a steep downgrade hazard;
D. Provide signage stating the recommended descent speed;
E. Exceed the minimum stopping sight distance; or
F. Provide a series of short switchbacks near the top of a descent to contain the speed of a descending bicyclist, or consider a portion of 10 to 20 ft length with a 1 to 2% grade at the point of direction change on the switchbacks to provide a resting area for the path user.
G. Provide small resting areas to break up a longer Grade

- ROADWAY CONFLICTS / INTERSECTIONS
  - Consider the Following:
    - A. Path Should Intersect Road at a 90-Deg Angle When Possible
      (Maximum 45 Degree Skew is Acceptable)
    - B. Increase Path Width at Intersection to Reduce User Conflicts
    - C. Provide Roadway Signage to Alert Motorists of Crossing
    - D. Provide Visible Crosswalk to Increase Awareness
    - E. Detectable Warnings Should Be Provided at All Crossings
    - F. Provide Signage to Indicate Whether Path User or Motorist has the Right-of-Way
    - G. Use Engineering Judgment and Warrants in MUTCD to Decide if Signalization is Required



DESIGN GUIDELINES

- ROADWAY CONFLICTS / REFUGE ISLAND
  - Consider if One or More of the Following Apply:
    - A. A high roadway traffic volume or speed creates unacceptable conditions for the path user;
    - B. The roadway is wider than 75 ft, or a pedestrian walking at 2.5 ft/s cannot completely cross the street during the green traffic-signal phase;
    - C. A mid-block shared-use-path crossing or a path-roadway intersection is located where there are limited gaps in traffic (complete gap study);
    - D. The crossing will be used by a number of people who cross relatively slowly, such as the elderly schoolchildren, persons with disabilities, etc.

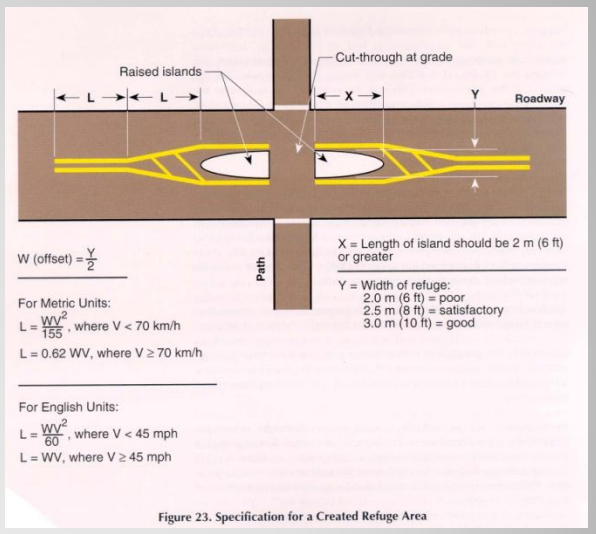


Figure 23. Specification for a Created Refuge Area

DESIGN GUIDELINES

- ROADWAY CONFLICTS / RESTRICTION OF MOTOR VEHICLE
  - Consider the Following:

A. A Lockable, Removable, or Collapsible Bollard (Can Create an Obstacle for Path Users)

B. Split Trail Into 5 Feet Sections Separated By Landscaping

DESIGN GUIDELINES

DESIGN GUIDELINES

- STRUCTURES
  - Bridge
    - A. A Structure Crossing a Stream with A Drainage Area of At Least 1 mi square
    - B. Requires an IDNR Construction In a Floodway Permit
    - C. Requires Hydraulic Modeling and Shall Not Create Backwater During a 100 Year Event
    - D. Should Match the Approaching Path Width Plus a 2-Ft Clear Width on Each Side of the Path
    - E. The Minimum Path Width is 8 Feet Plus 2-Ft Clear on Each Side

QUESTIONS?

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CIVIL ENGINEERS